

DESCRIPTIONS OF SOME NEW ARANEIDÆ OF NEW  
SOUTH WALES. No. 6.

BY W. J. RAINBOW.

(Plates XVIII.-XX.)

Family EPEIRIDÆ.

Genus NEPHILA, Leach.

NEPHILA ORNATA, sp. nov.

(Plate XVIII. figs. 1, 1a, 1b.)

♀. Cephalothorax 5 mm. long, 4 mm. broad; abdomen 7 mm. long, 4 mm. broad.

*Cephalothorax* dark mahogany brown, thickly clothed with silvery white hair; *caput* elevated, rounded on sides and upper part, deeply compressed at junction of cephalic and thoracic segments; two coniform tubercles at posterior extremity of cephalic segment. *Clypeus* broad, moderately convex; a deep transverse groove at centre, indented laterally; indentations bare, transverse groove sparingly clothed with hoary pubescence.

*Eyes* glossy black; the four central eyes are seated on a moderately convex eminence and form an almost quadrangular figure; of these the two comprising the front row are somewhat closer together than the hinder pair; the lateral eyes are much the smallest of the group, and are placed obliquely on small tubercles, but are not contiguous.

*Legs* long, slender, yellow-brown, a few fine yellow hairs; *tarsi* dark brown. Relative lengths 1, 2, 4, 3; of these the second and fourth pairs are almost equal, and the third much the shortest.

*Palpi* rather short, somewhat darker than the legs, rather thickly clothed with short dark hairs.

*Falces* dark brown, conical, smooth, inner margin fringed with dark hairs; fangs much darker; the margins of the furrow of each falk armed with a row of three strong teeth.

*Maxilla* dark at base; apex shiny, pale yellowish.

*Labium* longer than the base is broad; base and apex similar in colour to maxilla.

*Sternum* shield-shaped, straw colour, with small dark patches laterally.

*Abdomen* oblong, sinuous in outline, moderately convex, projecting over base of cephalothorax; superior surface dull yellowish, dark at anterior and posterior extremities, clothed sparingly with short silvery hairs; ornamented with a few dark spots, and from near the centre to anterior extremity with a network pattern of dark lines; sides and inferior surface dark brown, ornamented with a network of pale yellowish and uneven lines.

*Epigyne* a transverse oval, dark brown eminence, posterior lip more strongly elevated and convex than the anterior.

*Hab.*—Sydney.

(Contribution from the Australian Museum.)

NEPHILA PICTA, sp.nov.

(Plate XIX. fig. 1.)

♀. Cephalothorax 6 mm. long, 5 mm. broad; abdomen 11 mm. long, 7 mm. broad.

*Cephalothorax* shiny black, thickly clothed with silvery hairs; *caput* arched, clothed with silvery hairs, a few black shiny patches devoid of hairs; junction of cephalic and thoracic segments clearly defined; two shiny black coniform tubercles at base of cephalic eminence. *Clypeus* broad, slightly arched, clothed with silvery hairs; normal grooves distinct, black, shiny, and devoid of hairs; deeply indented at centre. *Marginal band* narrow, fringed with hoary hairs.

*Eyes* black; the four central eyes are seated on a moderately convex eminence, and form an almost quadrangular figure; the lateral pair are much the smallest, and are placed obliquely on small tubercles, but are not contiguous.

*Legs* long, slender, black, with broad yellow annulations; *trochanters* and *femurs* of first 2 pairs and femurs only of third and fourth pairs furnished at lower extremities with long black hairy plumes; *tibial joints*, *metatarsi* and *tarsi* black.

*Palpi* long, black, clothed with long black hairs or bristles.

*Falces* black, arched in front, slightly divergent, a few short black hairs on inner margins; a row of three teeth on each margin of the furrow of each falc wherein the fang lies when at rest; fangs black.

*Maxilla* club-shaped, arched, outer margins black, inner margins shiny, yellowish.

*Labium* conical, rather longer than broad, black at base, shiny and yellowish at apex.

*Sternum* cordate, longer than broad, surface uneven, black, with four small yellow lateral patches, a broad transverse curved yellow band at anterior part, and a small yellow patch at posterior extremity.

*Abdomen* ovate, projecting over base of cephalothorax, superior surface sparingly pubescent, olive-green, spotted with yellow and ornamented with a network pattern of tracery, and two rather large yellow spots at centre; sides similar in colour to superior surface; inferior surface dark, ornamented with a broad wavy transverse yellow band situated just below epigyne; besides this there are three other transverse yellow lines seated lower down, the first of which is curved in a posterior direction, and the two others forward.

*Epigyne* dark, strongly arched, concave within.

*Hab.*—Condobolin, N.S.W.

Type specimen in the collection of the Australian Museum, to the Trustees of which Institution I am indebted for the privilege of describing it.

## Genus EPEIRA, Walck.

## EPEIRA FICTA, sp.nov.

(Plate XVIII. figs. 2, 2a.)

♀. Cephalothorax 3 mm. long, 2 mm. broad; abdomen 5 mm. long, 5 mm. broad.

*Cephalothorax* pale yellow. *Caput* elevated, rounded on sides and upper part; a few short fine pale yellow hairs in front and at sides. *Clypeus* broad, strongly convex; normal grooves indistinct. *Marginal band* narrow.

*Eyes* black; the four intermediate ones seated on a somewhat quadrangular protuberance, forming a square or nearly so; of these the pair comprising the first row are separated from each other by a distance equal to their individual diameter, those of the second by about one-half, and each row is separated from the other by about the diameter of one eye; lateral pairs much the smallest of the group, placed obliquely on small protuberances, and almost contiguous.

*Legs* moderately long and strong, pale yellow, armed with strong black spines, and sparingly clothed with short fine yellow hairs; relative lengths 1, 2, 4, 3.

*Palpi* short, pale yellow, clothed with fine yellow hairs, considerably longer than those of the legs.

*Falces* pale yellow, strong; the margins of each falx armed with a row of three teeth; fangs yellowish-brown.

*Maxillæ* pale yellow, arched, inner margins thickly fringed with yellow hairs.

*Labium* concolorous, broad at base, strongly arched, one-half the length of maxillæ.

*Sternum* cordate, yellowish-green, truncate in front, bare and uneven.

*Abdomen* broad, ovate, overhanging base of cephalothorax strongly convex, green colour; with two large yellow spots, edged with dark brown towards anterior extremity; contiguous to each of these there is a much smaller yellow spot edged with dark

brown; towards posterior extremity there is a network of fine dark and uneven lines; sides of a somewhat darker green than superior surface; underside olive green.

*Epiygne* an elevated eminence; the two openings, though sensibly separated, are connected at anterior part with a pale yellowish curved bar; immediately above the curved bar mentioned there is another bar larger, stronger, and much more arched than the first mentioned.

*Hab.*—New England District.

EPEIRA SIMILARIS, sp.nov.

(Plate XVIII. fig. 3.)

♀ Cephalothorax 3 mm. long, 2 mm. broad; abdomen 5 mm. long, 5 mm. broad.

*Cephalothorax* pale yellow. *Caput* elevated, rounded on sides and upper part, a few short fine pale yellow hairs in front and at sides. *Clypeus* broad, strongly convex; normal grooves indistinct. *Marginal band* narrow.

*Eyes, legs, palpi, falces, maxillæ, labium* and *sternum* similar to *E. ficta*.

*Abdomen* broad, ovate, overhanging base of cephalothorax, moderately convex, green, with a broad transverse irregular patch of dull white towards anterior extremity, and which is broadest laterally; there are two large dark brown unevenly formed lateral patches so situated as to be surrounded by portions of the white patch referred to; in addition to these there are two small median depressions or dents, the depths of which are of a dark brown colour; from about the centre to the posterior extremity there is a network of fine uneven lines; sides green; under side dull green.

*Epiygne* an elevated eminence; the two openings more widely separated than in *E. ficta*, and not connected at anterior part, as in that species, with a curved bar; above the openings, and slightly overhanging them, there is a large strong arched bar as in the former species.

*Hab.*—New England District.

## EPEIRA WAGNERI, sp. nov.

(Plate XIX. figs. 2, 2a, 2b, 2c, 2d.)

♀. Cephalothorax 5 mm. long, 4 mm. wide; abdomen 6 mm. long, 5 mm. wide.

*Cephalothorax* yellow-brown. *Caput* elevated, rounded on sides and upper part. *Clypeus* broad, convex, normal grooves indistinct; a deep transverse cleft at centre. *Marginal band* narrow, black.

*Eyes* black; the four central eyes forming a square or nearly so; front pair separated from each other by about one eye's diameter; second pair by a distance equal to about three-fourths of their individual diameter; lateral pairs seated obliquely on tubercles, much the smallest of the group.

*Legs* long, strong, clothed with short black hairs and spines; coxæ pale straw colour; *trochanters* with lower half pale straw colour, the remainder reddish-brown; *femurs*, *tibia* and *tarsi* reddish-brown. Relative lengths 1, 2, 4, 3.

*Palpi* long, similar in colour and armature to legs.

*Falces* reddish-brown, shiny, inner margin fringed with short hairs; the outer margin of the furrow of each falx armed with three teeth, and the inner two; fangs strong, dark brown.

*Maxilla* yellow-brown, convex exteriorly, a thick fringe of short black hairs on inner margins, a few long black ones on the outer margins.

*Labium* broad, half the height of maxilla, rounded off at apex.

*Sternum* shield-shaped, dark brown, lighter at the middle; surface uneven.

*Abdomen* oblong, convex, slightly projecting over base of cephalothorax; upper surface mottled yellow and brown; at anterior extremity two large dark and brown patches laterally; four rather deep indentations at the centre; a large leaf-like design, darkest at its outer edges, runs the entire length of the upper surface; sides mottled dark brown and yellow, with green markings; inferior surface yellowish, with dark brown patches.

The males of this species are pigmies in comparison to the females, but are exactly like them in colour and formation. The sexes pair during January and February, and live together in the same nest during that period. A more detailed account of their nidification, &c., will be found in another part of this paper. I have much pleasure in dedicating this species to my esteemed contemporary and correspondent, Professor Waldemar Wagner, of Moscow, who has published an admirable work, "L'Industrie des Araneina," in the "Mémoires de L'Académie Impériale des Sciences de St. Pétersbourg. vii<sup>e</sup> Série. Tome xlvii. No. 11."

*Hab.*—Sydney.

Family LYCOSIDÆ.

Genus DOLOMEDES, Latr.

DOLOMEDES NEPTUNUS, sp.nov.

(Plate XVIII., figs. 4, 4a.)

♀. Cephalothorax 4 mm. long, 3 mm. broad; abdomen 3 mm. long, 5 mm. broad.

*Cephalothorax* pale yellowish, strongly convex, clothed with pale yellowish pubescence; normal grooves and indentations indistinct.

*Marginal band* broad.

*Eyes* black; front row smallest of the group, and slightly pro-curved, middle eyes somewhat larger than their lateral neighbours, all equidistant; eyes of second row large, separated by a space equal to once their individual diameter; third row large, separated from each other by four diameters.

*Legs* strong, moderately long, pale yellowish; clothed with yellowish pubescence, and short, strong black spines. Relative lengths 4, 1, 2, 3.

*Palpi* moderately long; similar in colour and armature to legs.

*Falces* slightly divergent, strong, pale yellowish, clothed with pale yellowish pubescence, arched in front; a row of three black teeth along the margins of the furrow of each falx, those

on the underside seated much nearer to the apex than those of the upper margin; fangs long, dark brown.

*Maxille* long, arched in front, inclining inwards, thickly clothed with pale yellowish pubescence.

*Labium* half as long as maxillæ, coniform, arched in front, pale yellowish, thickly clothed with yellowish pubescence.

*Sternum* elliptical in outline, dark brown, shiny, clothed with yellowish pubescence.

*Abdomen* oblong, pale yellow, slightly projecting over base of cephalothorax, clothed with yellowish pubescence, and ornamented with dark brown spots, flecks, and at posterior extremity a rectangular figure; sides and inferior surface pale yellowish with yellow pubescence.

*Epigyne* a curved transverse slit.

*Hab.*—The shores of Port Jackson.

#### DOLOMEDES SPINIPES, sp.nov.

(Plate XVIII., fig. 5).

♀. Cephalothorax 3 mm. long, 2 mm. broad; abdomen 4 mm. long, 2 mm. broad.

*Cephalothorax* pale yellowish, convex, clothed with coarse yellowish hairs, normal grooves and indentations indistinct. *Caput* elevated, rounded on sides and upper part, shiny, a few long coarse hairs at sides and in front. *Marginal band* broad.

*Eyes* black; front row smallest of the group, slightly procurved, middle eyes somewhat larger than their lateral neighbours, all equidistant; eyes of second row large, separated by a space equal to once their individual diameter; third row same size as those of the second, but separated from each other by four diameters.

*Legs* moderately long, strong, yellowish, thickly clothed with coarse yellowish hairs, and on upper sides of trochanters and femurs short, strong black spines; on the under sides of these joints long, strong black spines; *tibial and tarsal joints* furnished



above and below with long, strong black spines. Relative lengths 1, 4, 2, 3.

*Palpi* moderately long, similar in colour to legs, clothed with long, coarse yellowish hairs.

*Falces* slightly divergent, strong, pale yellowish, clothed with pale yellowish hairs, longest on the inner margins, arched in front; a row of three black teeth on each margin of each falx; fangs long, strong, dark brown.

*Maxillæ* pale yellowish, long, arched in front, clothed with long, coarse, pale yellowish hairs.

*Labium* pale yellowish, shiny, half as long as maxillæ, broad, rounded off at apex, a few long yellowish hairs, a thick fringe of long hairs at under side of apex.

*Sternum* shield-shaped, pale yellowish, thickly clothed with long yellow hairs.

*Abdomen* oblong, ovate, moderately convex, slightly projected over base of cephalothorax; superior surface, sides and inferior surface pale yellowish, thickly clothed with long, coarse, yellow hairs.

*Epigyne* a curved transverse slit, the curvature directed forwards.

*Hab.*—The shores of Port Jackson.

#### Family MYGALIDÆ.

Genus ACTINOPUS, Klug.

ACTINOPUS FORMOSUS, sp.nov.

(Plate xx)

♂. Cephalothorax 4 mm. long, 5 mm. broad; abdomen 4 mm. long, 2 mm. broad at base, 4 mm. at posterior extremity.

*Cephalothorax* broad. *Caput* broad, high, strongly arched, truncate in front, bright red; junction of cephalic and thoracic segments sharply defined. *Clypeus* broad, blue-black, moderately convex, normal grooves and indentations fairly distinct. *Marginal band* broad.

*Eyes* arranged in three groups; central pair dark, shiny, seated on a slightly raised dark brown eminence, and separated from each other by a space equal to once their individual diameter; lateral eyes in groups of three, each group forming a triangular figure; the front lateral eyes are sensibly the largest of the eight; the inner eyes of the triangular figures are the smallest of the group, and are of an opaline tint with black rings.

*Legs* long, strong, shiny, dark brown, almost black, furnished with rather long, fine black hairs, and few short stout spines. Relative lengths 1, 2, 4, 3.

*Palpi* long, strong, similar in colour to legs, and furnished with long black hairs; fifth joint much the strongest; copulatory organs tinged with red, directed backwards, spiral at base, tapering, and terminating with a long strong spine, the spine directed outwards in a horizontal position.

*Falces* long, strong, bright red, strongly arched, divergent at apex, where they are furnished with long coarse black hairs; fangs long, shiny, reddish-brown.

*Maxille* red, long, broad at base, tapering outwards to a point, arched in front, inner margins clothed with long coarse black and white hairs or bristles.

*Labium* red, strongly arched, longer than broad, conical, fringed with black hairs at apex.

*Sternum* somewhat elliptical, red in front, darker laterally; dark brown, with reddish-brown lateral indentations towards junction with abdomen; a deep indentation in front under labium.

*Abdomen* triangular, slightly projecting over base of cephalothorax, broadest at posterior extremity; dark brown, nearly black, thickly clothed with long coarse hairs; a long, rather deep indentation runs down the abdomen from near its anterior to the posterior extremity, where it is slightly indented; sides and inferior surface similar to superior.

*Hab.*—Menindie, N.S.W.

This species is the first of its genus recorded from Australia, and is consequently of more than ordinary interest. The spider was captured by Mr. A. G. Little, Railway Surveyor, Menindie. I

am indebted to Mr. Henry Deane, M.A., for the privilege of describing this species.

Of the eight species described in the present paper, five of them (*Epeïra ficta*, *E. similaris*, *E. wagneri*, *Dolomedes neptunus*, and *D. spinipes*) are especially interesting from the fact that they, in common with hosts of other animals, are protected from the raids of predatory foes either by colouration or mimicry. Rambling along our sea beaches certain small spiders are occasionally found lurking amidst the masses of small and broken shells denoting high water mark, and corresponding so accurately in colour to the sea-wrack referred to, that it is utterly impossible to detect them unless they are in motion; and not only is this so, but their habit of feigning death, upon the approach of what they suspect to be danger, adds greatly to the deception. Of these, *Dolomedes neptunus* and *D. spinipes* are instances in point.

One day last summer, while helping my boys to gather some shells at Taylor Bay, Port Jackson, I discovered one of the spiders referred to (*D. neptunus*). In endeavouring to catch it, it eluded me in the manner described, and so successfully that it was only by probing the shells and pebbles until my forceps touched "something soft" that I succeeded in making my capture. Throughout the entire range of natural history there is no chapter more replete with interest than the marvellous provision of Nature in clothing her subjects, not otherwise protected, with colours identical with their surroundings, thus enabling them not only to baffle the vigilance of their foes, but also by natural disguises to aid them in successfully stalking their prey. Numerous and extraordinary are the disguises assumed, and although many have been recorded and described, much work yet remains to be done. This will require the exercise of much patient observation and labour, and will be of immense value to science.

Many spiders that are exceedingly conspicuous while resting in their webs are practically hidden from view when sheltering among leaves and twigs, the hues of which harmonise exactly

with their own. All shades of green, brown, and grey are found among arboreal individuals. Mr. Arthur Lea gave me a number of spiders collected by him both in the New England district and at Queanbeyan, among which there are examples, not only coloured like withered leaves, but some are green and marked with mock-holes (as in *Epeira ficta*), and others with discoloured patches on their surface, having the appearance of leaves attacked by some insect (as in *E. similis*\*). Quite a host of examples, both of spiders and beetles, whose colouration is protective, may be obtained by shaking a branch of any shrub over an inverted, open umbrella. Among the species whose haunts are confined to the ground, and those that ramble among rocks, the same rule obtains, the former harmonising with the colour of the soil, while the latter reflect not only the various tints of the rocks, but frequently mimick the lichens growing upon them.

Mr. C. M. Weed says that the Ash-Grey Harvest Spider, *Phlangium cinereum*, Weed, "is pre-eminently what may be called an indoor species. It abounds especially in sheds, out-houses, and neglected board piles, being rarely found . . . in the open field. Its colour especially fits it for crawling over weather-beaten boards, making it inconspicuous against such a background. During the day it is usually quiet, but at dusk and on cloudy days it moves about quite rapidly."†

Governed by the law of natural selection, the tints of animals frequently undergo certain modifications in order to suit them to altered conditions of surroundings‡. In tracts of bush that have been visited by fire, we find specimens so closely resembling the

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\* Writing upon the subject of his observations at Pera, Mr. H. W. Bates observes:—"The number of spiders ornamented with showy colours was somewhat remarkable. Some double themselves up at the base of leaf-stalks, so as to resemble flower-buds, and thus deceive the insects on which they prey." "The Naturalist on the River Amazon," p. 64.

† "American Naturalist," xxvi. p. 33.

‡ See Wallace's "Tropical Nature," pp. 167-172, for some interesting facts under this head; also paper by Mr. R. Meldola, on "Variable Protective Colouring in Insects." Proc. Zool. Soc. Lond. 1873, p. 153.

charred branches or bark that when motionless it is utterly impossible to perceive them.\* In some species the modification is very gradual, while in others the change is more rapid. An American author, Mr. J. Angas† states that when he placed a white variety of what he terms the "little flower spider" on a sun-flower it became quite yellow in from two to three days.

The habit of lying motionless when alarmed is common among sedentary spiders, such as the *Epeiridæ* and *Theridiidæ*; but it is badly developed in some and entirely absent in others of the jumping and swift-running species. Among the orb weavers the *Gasteracanthidæ* are singularly and effectively protected against the raids of insectivorous birds. Resting in the centre of their orbitular snares, fully exposed, the need of a protective armature is obvious, and this is afforded by their hard, horny and spiny abdomens. Likewise, the spines of *Acrosoma*, rendering the spiders similar in appearance to thorny leaves, knots of shrubs, acacias, &c., are also protective, and make these animals decidedly objectionable to insectivorous birds and reptiles. As in the case of the *Gasteracanthidæ*, the spiders of the genus *Acrosoma* also construct their webs in exposed situations, and sit fearlessly in the centre of the snares as though conscious of their security from attack.

In many instances specimens, when viewed in the cabinet, would not be likely to suggest the idea that their form and colouration are protective, yet when observed in the midst of their natural surroundings the fact that such is the case is forced upon the observer. Again, some specimens lose their natural colours when placed in spirit. This is the case with *Epeira*

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\* Mr. A. T. Urquhart in an interesting paper observes that "The generality of spiders found amongst burnt manuka, before it has become bleached, have the brownish-black colour of their environment, which causes them to be almost imperceptible at a very short distance."—"On the Protective Resemblances of the *Araneida* of New Zealand," Trans. N.Z. Inst. Vol. xv. 1882, p. 175.

† "American Naturalist," xiv. p. 1010.

*wagneri*. *Attus volans*, Camb., on the other hand, redisplay all its brilliancy when taken out of the tube and the spirit has evaporated from its body.

The long attenuated bodies of the *Tetragnatha*, of which *T. cylindrica*, Koch, and *T. lupata*, Koch, each found in the vicinity of Sydney, are admirably adapted for concealment. These spiders when alarmed seek refuge upon the stems or branchlets of shrubs, and so closely do their tints agree with their surroundings that detection is exceedingly difficult. *Epeïra higginsii*, described and figured by Koch, and recorded by that eminent author from Darling Downs, but whose range extends far south of Sydney, is a singularly interesting example as far as its form is concerned; but in addition to that, its colouration and powers of mimicry are admirably adapted as a shield and protection. When disturbed it runs out of its snare to one of the supporting lines or guys, and there remains suspended, with its legs doubled up, the exact imitation, both in form and colour, of an autumn leaf. Writing to me upon the subject of protective colouration in spiders, my esteemed correspondent and contemporary, H. R. Hogg, Esq., M.A., of Cheniston, Upper Macedon, Victoria, says:—"With regard to the protective colouring of spiders, I have frequently been asked if they have not sometimes the power of changing colour like chameleons in accordance with their surroundings. I must confess that all I have seen tends to show exactly the opposite, and that while many, if not most, are paler in their earlier stages, they get darker as they grow older. This is especially noticeable in laterigrades. The colouring matter of spiders, both in skins and hairs, is of a particularly lasting character, and even in spirits takes a long time to fade,\* so that it would probably take a good many generations to alter the generally characteristic colouring of different species so as to conform to particular soils or vegetation. At the same time I

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\* I have spirited numerous specimens of *E. wagneri*, and not one retained its bright green and yellow colours two or three hours after emersion.—W.J.R.

have found a delicately-tinted green *Epeïra* on the similarly coloured green leaf of a lily, and a friend recently told me he had found a very brightly coloured yellow spider (which he did not bring me) on a yellow *Cosmos* flower."

Not only do spiders, in addition to colouration, possess the faculty of mimicry as a protection against birds, reptiles, &c., but their cocoons in some instances are also protected. The cocoon of *Epeïra herione*, Koch, is made of withered leaves closely bound together, and suspended to one of the supporting lines or guys above the orbital portions of the mesh, and looks more like a discoloured mass of rubbish rather than a nest containing eggs. Writing "On the History and Habits of the *Epeïra Aurelia* Spider,"\* Mr. Frederick Pollock remarks:—"The favourite haunt of *E. aurelia* is the prickly pear—a plant from which the cocoon can scarcely be distinguished in colour, and so close is the resemblance that the first time I saw one of these cocoons, I could hardly believe that it was not a withered piece of the cactus." Anton Stecker also records a case of protective resemblance in the nest of an *Epeïra* at Sokna (Tripoli),† covered with *débris* and the elytra of beetles, &c., and Odewahn ‡ obtained at Gawler (South Australia) some globular spiders' cocoons, found on branches of trees, and resembling the fruit of *Leptospermum*, the spiders of which were hanging near them, and resembled the excrement of some bird in appearance, a wonderful form of mimicry to which I shall presently have occasion to refer.

In *Cyrtarachne caliginosa*, recently described and figured by me,§ we have, indeed, an extraordinary form. It is well known that hairy caterpillars are exceedingly distasteful to birds; consequently it is only reasonable to assume that the long hairs upon

\* Annals and Magazine of Nat. Hist. 3rd series, Vol. xv., p. 459; June 1, 1865.

† Mittheilungun der africanischen Gesellschaft in Deutschland, ii. pp. 78-80.

‡ Proc. Ent. Soc. 1864, p. 57.

§ P.L.S.N.S.W. Vol. ix. (2nd series) pp. 154-157; pl. x. figs. 2, 2a, 2b.

the cephalothorax, abdomen and legs of this remarkable spider have a like deterring effect upon predatory birds—that they form, in other words, a coat of safety. Mr. G. F. Atkinson has drawn attention to an American form of *Cyrtarachne*\* that mimicks a snail shell, the inhabitants of which are exceedingly common during the summer and autumn. The abdomen of the spider overhangs the cephalothorax, is broad at the base—broader, in fact, than the length of the spider, and rounded off at the apex. When resting upon the underside of a leaf, with its legs retracted, it strongly resembled one of the snail shells by the colour and shape of its abdomen. Two specimens collected by Mr. Atkinson deceived him at first, but a few threads of silk led him to make an examination. The spider seemed so confident of its protection, that it would not move when he jarred the plant, and only displayed signs of movement when transferred to the cyanide bottle. Some cocoons of *C. multilineata* were also described that strongly resembled insect galls. *Epeira wagneri* is a common spider in the bush around Sydney. It is brightly coloured with green and yellow—colours admirably adapted for concealment when it drops out of the web, and seeks shelter among the coarse herbage, which it will do when alarmed. It is chiefly interesting, however, on account of its web and leaf nest. The web is placed low down, and in shape does not form a complete orb. The main supporting lines from which the mesh depends, are stretched horizontally and obliquely, and from the centre of these the radii and spirals are directed. The irregular lines at the upper part of the structure somewhat resemble the architecture of the typical *Theridiida*. The leaf-nest is placed at the base from which the radii start, and in this, during the period of mating, both sexes dwell, but at other periods the female is the only tenant. The leaf most commonly used is that of a Eucalypt, which is worked into the desired shape according to the leaf used; thus, for instance, a narrow leaf is rolled spirally, and a broader one is doubled over, the edges being tightly bound down with silk. In

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\* American Naturalist, xxii. pp. 545-546.



localities where Eucalypts are not abundant, other leaves are used, and those of *Lantana camara* are not uncommon.

The interior of these nests is beautifully lined with silk. The cocoon is attached and suspended among the supporting lines on one side of the web; it consists of a Eucalypt leaf doubled over so that the tip and base nearly meet. The eggs are deposited inside the folded leaf, and then it is sealed up firmly and tightly, the female mounting guard during the period of incubation. At Waterfall and Fairfield, I have met with another species of *Epeira* (at present undetermined) that constructs a mesh and makes a leaf-nest like the one just described.

Among the *Thomisidæ* there are some interesting examples of protective colouration and mimicry. Two spiders found within the vicinity of Sydney, but whose range extends both to the northern and southern colonies, namely *Celania excavata*, Koch, and *Thlaosoma dubium*, Cambr., mimic the excreta of birds.

When awaiting their prey these spiders lie on their backs, and in this position their appearance suggests that of a bird's dropping, the denser part of the body on the underside being of a chalky colour, spotted and streaked with dark markings; then, too, the legs, owing to their colour and being closely pressed up to the body, add greatly to the deception. In addition to all this a little loose silk is spun over a portion of the surface of a leaf, in the centre of which the spider lies; this completes the deception as it resembles the more liquid portions of the faeces running off the leaf, and thickening at the edge as it trickles over. The deception is just as complete as could well be imagined. No one looking at either one or the other of these spiders in the situation described would ever imagine, unless previously aware of the fact, that an animal lay before them patiently awaiting the descent of some unwary insect in quest of food, yet such is the case. These spiders hold themselves in position by inserting the strong spines with which their legs are armed, under the loose silk referred to. *C. excavata* makes a nest of dead, brown leaves; the cocoons or egg-bags vary in number. Mr. F. A. A. Skuse recently showed me a living

specimen that had been forwarded to the Australian Museum from Cavendish, in the Western District of Victoria; it was a female, and was mounting guard over exactly one dozen egg-bags. The cocoons are spherical, uniform in size, somewhat brittle, and in appearance resemble the kernels of the Quandong (*Fusanus acuminatus*). Mr. H. O. Forbes, F.R.G.S.,\* discovered a like case of mimicry in Java, but his book is so well-known that it would be superfluous here to recapitulate the facts as communicated by him. It need only be noted, therefore, that the species discovered by him formed the type of a new genus, *Ornithoscatoides*, Camb. Mr. G. F. Atkinson also notes a case of mimicry† by a small spider of this family—*Thomisus aleatorius*, Hentz. This species is very common on grass, to the summit of the culms of which it climbs, where, clinging with its posterior legs to the stem and its anterior legs on each side approximated and extended outwards, it thus forms an angle with the stem, strikingly similar to that formed by the spikelets. The genus *Stephanopis*, Cambridge, is another group of remarkable spiders. By the form and arrangements of their legs, which are laterigrade, they can move forwards, backwards, or in a lateral direction with facility. They are generally found lurking under loose bark, or among the rugulosities of trees. Their colour and rugged appearance—closely resembling bark—not only shield them from the raids of enemies, but aid them in the capture of prey, which they take either by stealth or pursuit. The colouration and ornamentation of the genus *Cymbacha* are also protective. These spiders also have laterigrade ambulatory limbs. They are found in similar localities to the *Stephanopis*. *C. festiva* and *C. saucia* are found both in Queensland and New South Wales, and each has been found in the vicinity of Sydney. While upon the *Laterigradae*, I must not omit to mention those of the genus *Voconia*, Thor. These huge uncanny spiders are common enough

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\* A Naturalist's Wanderings in the Eastern Archipelago, pp. 63-65, and a figure.

† American Naturalist, xxii. pp. 545, 546.

in the bush around Sydney, as well as in the interior. If a piece of loose bark be stripped off the trunk of a tree, or from a decaying log, several of them may be seen scampering off with great rapidity. Representatives of this and allied genera are also to be found lurking under stones. These spiders have large, flat, hairy bodies, and remarkably long legs, and so are well adapted to the situations in which they are found, while their general dull colour harmonises to a nicety with their surroundings. Although the superior surface of the abdomen of some of these spiders is ornamented to a certain degree, their appearance nevertheless is hardly such as could be expected to inspire confidence. Bushmen have a deep-seated horror of them, and state that the results of their bite is not only painful, but exceedingly dangerous. *V. immanis*, *V. dolosa*, and *V. insignis*, each of which is described and figured by Koch in his admirable work, "Die Arachniden des Australiens," are to be found in the bush, not only in the vicinity of Sydney, but also at Brisbane and Rockhampton. In a small collection forwarded to me by Dr. Roth, from Winton, Central Queensland, there were specimens of *V. immanis* and *V. dolosa*, which, he informs me, he captured in his house.

The obnoxious odours and flavours of some insects, as in those butterflies of the *Heliconii* and *Danaïde*, render them safe from the raids of natural enemies. Thus Mr. Belt, in his delightful work,\* states that when he tried to feed his pet monkey with some of the former, though he (the monkey) would take them when offered, and sometimes smell them, he would invariably roll them up in his hand, and drop them quietly again in a few minutes; also, whenever he placed any of the *Heliconii* in the web of a species of *Nephila*, the spider would drop them out, although another species of *Araneidæ* seemed fond of them.

It has been observed by naturalists working in different parts of the world that some species of *Attidæ* are remarkable for their

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\* "The Naturalist in Nicaragua," pp. 316, 317.

mimicry of ants. Bertkau\* has recorded the fact from Prussian-Rhineland and Westphalia; Walsh,† from Bengal; Bates,‡ and Peckham,§ from the United States; Belt,|| from Nicaragua; Mansel Weale,¶ from Africa; Rothney,\*\* from Barrackpur; besides other authors. The ants that are chiefly mimicked by spiders are those that live on trees or shrubs. Owing to their powers of biting, their acrid secretions which they can eject to a considerable distance at an approaching enemy, the obnoxious odours emitted, their dwelling in communities, and fighting battles in a united body for the common good, they are admirably protected from birds and small animals that prey upon insects. This being so, those spiders that mimic them and wander about their haunts must enjoy an almost absolute immunity from dangers that beset solitary wanderers. The *Attidae* do not spin webs for the capture of prey, but take their victims by stealth, stalking them, and springing upon them from behind. So great is the resemblance of these *Attidae* to the ants that experienced collectors viewing them when alive are frequently deceived.†† Not only does the colour harmonise with that of the insect mimicked, but the

\* "Ameisenähnlichkeit unter Spinnen," &c., Verhand. des naturhist. Vereines der Preussischen Rheinlande und Westfalens (Bonn), xliii. (1886), pp. 66-69. Bertkau also notes in the same paper that certain *Drassidae* mimic ants, more particularly the genera *Phrurolithus* and *Micaria*. Among the *Thomisidae* and *Epeiridae*, he observes, this kind of mimicry is unknown; but the *Theridiidae* furnish a beautiful example in *Formicina mutinensis*. On elms infested by *Lasius* and *Formica* a species of *Laseola* occurs, the male of which alone resembles ants.

† Journal of the Asiatic Society of Bengal, 1891, No. 1, pp. 1-4.

‡ Trans. Linn. Soc. Vol. xxiii.

§ Papers of the Nat. Hist. Soc. Wisconsin, 1892, pp. 1-83.

|| "Naturalist in Nicaragua," p. 314.

¶ "Nature," Vol. III. p. 508.

\*\* Journal of the Bombay Nat. Hist. Soc. Vol. v. p. 44.

†† Mr. W. W. Froggatt informs me that a small black *Chalcid* on the tree trunks at Mosman's Bay mimicks a small jumping spider, and was taken by him as a spider.

contour of the body and the manner of carrying the first pair of legs, so as to appear like antennæ, and which, ant-like, they keep in motion when running about, make the deception complete. All observers, whose works I have consulted, with the exception of Dr. E. G. Peckham, are unanimous in their testimony as to the manner in which these ant-mimicking *Attidæ* carry the first pair of legs. Of those species I have observed mimicking ants each carried the first pair of legs in imitation of antennæ. But Dr. Peckham says that an American species (*Synageles picta*) "holds up its second pair of legs to represent antennæ." Tull Walsh considers that this peculiarity of habit may be accounted for by a difference in the relative lengths of the legs, although another American species (*Synemosyna formica*) observed by Peckham\* to use its second pair of legs in imitation of antennæ has the usual formula of legs—4, 1, 3, 2.

Tull Walsh in an interesting paper† says:—"I have noticed that the spiders are probably protected from birds and other enemies by their resemblance to ants, but there can be no doubt that frequently they also thereby gain another very considerable advantage. The ants with which these spiders most do congregate are fairly omnivorous feeders, but show a decided preference for sweet juices often to be found exuding from trees, fruit, or flowers. To these juices come also flies, small beetles and other insects which form the natural prey of the spiders, and which do not, under the circumstances, particularly fear the ants. Thus while the flies are sucking up sweetness in company with the ants, the spider is no doubt able under its disguise to approach near enough to make a spring upon the unsuspecting victim, and to fix his sharp falces into its body. As regards the ants themselves, they do not seem to take any notice of the spiders, and do not apparently attack them." It would be absurd to suppose that spiders delude the ants by their disguise; on the contrary, it is

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\* "Protective Resemblance in Spiders." Papers of the Nat. Hist. Soc. Wisconsin, 1892, pp. 174-76.

† Journal of the Asiatic Soc. of Bengal, 1891, No. 1, p. 4.

more reasonable to assume that the disguise is solely for the purpose of shielding them from the attacks of insectivorous foes and enabling them to stalk their prey. So far as these spiders are concerned (the ant-like *Attidae*), the ants have little to fear from them; and, although I have watched closely on numerous occasions, I never yet saw an ant attacked by a spider. Indeed, their natural ferocity, hardness of body, and faculty of combining to withstand assault, would tend to show that spiders were more likely to be attacked by ants than that the ants would be attacked by spiders. This view was held by Mr. Belt, who observed:—"The use that the deceptive resemblance is to them has been explained to be the facility it affords them for approaching ants on which they prey. I am convinced that this explanation is incorrect so far as the Central American species are concerned. Ants, and especially the stinging species, are, so far as my experience goes, not preyed upon by any other insects. No disguise need be adopted to approach them, as they are so bold that they are more likely to attack a spider than a spider them. . . . Their real use is, I doubt not, the protection the disguise affords against insectivorous birds. I have found the crops of some humming birds full of small soft-bodied spiders, and many other birds feed on them. Stinging ants, like bees and wasps, are closely resembled by a host of other insects; indeed, whenever I found any insect provided with any special means of defence, I looked for imitative forms, and was never disappointed in finding them."\* Among the Australian *Attidae* that mimic ants are *Synemosyna lupata*, Koch, recorded from Port Mackay, *Leptorchestes striatipes*, Koch, and *L. cognatus*, Koch. These two latter species occur in the vicinity of Sydney. I have in my possession, from various parts of New South Wales, several undetermined species of *Attidae* that mimic ants, and which will hereafter provide material for description.

The late Mr. F. A. A. Skuse informed me of a remarkable example of the mimicry of a dipterous insect by a spider (undetermined, but probably an *Attid*) that came under his notice

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\* "Naturalist in Nicaragua," pp. 314, 315.

at Thornleigh. Both spider and fly were equal in size, small, and brightly coloured, the thorax bright red, and the abdomen bright green; the tips of the tarsi of the spider were white like the tips of the wings of the fly, and each were found on the bracken (*Pteris aquilina*, var. *esculenta*). When in want of a meal the spider throws up two legs on each side of its body, loops them together by hooking the tarsi, and beats the air vigorously, the result being that the light striking through the loops gives the appearance of a pair of bright transparent wings in rapid motion, and the fly, evidently convinced that it is one of its friends, alights, only to fall a victim to a remorseless enemy. Mr. Skuse also informed me that the spider in question is capable of jumping a considerable distance—not less than six inches, and that when in the air it has the appearance as if flying.\*

*Summary.*—Now it has been abundantly proved by Poulton, Beddard, Wallace, Darwin, and others, that colouration and mimicry in animals play an important and essential part either for *protection* against natural enemies, as a *warning* to others, or *attraction* for prey; and the more they are studied, and their life histories investigated, the more clearly do we understand why the tints of some animals are so bright and glaring, and others so dull and sombre. After much patient work and investigation, and the collection of a vast array of facts such as I have enumerated, but which included observations from a far wider field in animated Nature, Wallace divided living organisms into five groups in his classification of “Organic Colours,”† namely:—

Animals.	{	1.—Protective colours.	
		2.—Warning colours.	{ (a) of creatures specially protected. (b) of defenceless creatures mimicking a.
		3.—Sexual colours.	
		4.—Typical colours.	

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\* *Attus volans*, Camb., the “Flying Spider,” which so far has only been found at Sydney, is small and exceedingly bright.

† “Tropical Nature,” p. 172.

Plants.—5.—Attractive colours.

For the purposes of this paper it will suffice to divide the *Araneidae* into two groups, namely:—

1.—(a) Protective colouration, and (b) formation.

2.—Spiders that mimick: (a) animate and (b) inanimate objects, and (c) whose colours are attractive.

*Protective Colouration and Formation.*—In the course of my remarks, I have drawn attention to the fact that certain spiders are protected by the uniformity of their colouration to surrounding objects. Thus we have seen that while the colour of one spider harmonises with that of the small and broken shells on our sea-beaches, another group (*Stephanopsis*) finds shelter by its close resemblance to the bark of trees; then again, there are others whose physical formation is protective, and of such are the genera included in the subfamily of *Gasteracanthidae*, whose hard, horny, and generally spiny epidermis make them anything but tempting morsels for insectivorous birds.

*Spiders that mimick animate and inanimate objects, and whose colours are attractive.*—This group contains those spiders whose protection is secured, or who capture their prey by the mimicry of animate and inanimate objects, and in this class we have the extraordinary case of mimicry reported by Mr. Skuse, in which, by the elevation of one pair of legs on each side of its body, looping them together by the tarsi, and beating them rapidly up and down, a certain species of spider, in addition to its colouration, adds that of the mimicry of a pair of wings, and thus secures as prey a certain dipterous insect. Again, there is the no less wonderful mimicry by certain spiders, even to the most minute detail, of birds' droppings—a form of mimicry that not only secures them from the raids of their common enemies, but also attracts those insects upon which they prey.

*Conclusion.*—Taken collectively, these facts add an important link to the great chain of evidence upon which the law of natural selection is based and built. Much more might be added, but sufficient has been given to illustrate the great truths comprised in that law. I am indebted to my colleague, Mr. Edgar R. Waite, for the admirable coloured drawing of *Actinopus formosus*, which has been reproduced in Plate xx.



## EXPLANATION OF PLATES.

## PLATE XVIII.

- Fig. 1. — *Nephila ornata* ♀.  
 Fig. 1a. — „ „ abdomen in profile.  
 Fig. 1b. — „ „ Epigyne.  
 Fig. 2. — *Epeira ficta* ♀.  
 Fig. 2a. — „ „ Epigyne.  
 Fig. 3. — „ *similaris* ♀.  
 Fig. 4. — *Dolomedes neptunus* ♀.  
 Fig. 4a. — „ „ eyes.  
 Fig. 5. — „ *spinipes* ♀.

## PLATE XIX.

- Fig. 1. — *Nephila picta* ♀.  
 Fig. 2. — *Epeira wagneri* ♀.  
 Fig. 2a. — „ „ Folded eucalypt leaf nest  
 Fig. 2b. — „ „ Rolled eucalypt leaf nest  
 Fig. 2c. — „ „ Folded leaf (*Lantana camara*) nest  
 Fig. 2d. — „ „ Leaf of a eucalypt folded over to form cocoon.
- } Entrance  
 to each  
 nest shown  
 at A.

## PLATE XX.

- Fig. *Actinopus formosus* ♂ (×3).